



2022 KENNEDY SPACE CENTER Annual Report





Back in 1967, the Saturn V vehicle for the Apollo 4 mission on the Crawler Transporter Vehicle rolls out from the Vehicle Assembly Building. Credit: NASA

On March 17, 2022, the Space Launch System rocket with the Orion spacecraft aboard rolls out of the Vehicle Assembly Building for the first time. Credit: NASA/Keegan Barber



Cover photo: A full Moon is in view from Launch Complex 39B at NASA's Kennedy Space Center in Florida on June 14, 2022. Credit: NASA/Cory Huston

Back cover photo: A United Launch Alliance Atlas V rocket lifts off on May 19, 2022, from Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida for NASA Boeing's uncrewed Orbital Flight Test-2 (OFT-2) for the agency's Commercial Crew Program. Liftoff for OFT-2 occurred at 6:54 p.m. EDT. Photo credit: NASA/Kevin Davis and Chris Coleman

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Axiom Mission 1 (Ax-1) lifts off from Launch Complex 39A at NASA's Kennedy Space Center in Florida at 11:17 a.m. EST on April 8, 2022. The Ax-1 mission is the first private astronaut mission to the space station. Credit: NASA/Ben Smegelsky

Center Director Welcome



This was a historic year for Kennedy Space Center as we celebrated our 60th year supporting science, technology, exploration, and human space flight. Kennedy was established to advance what is perhaps one of the most ambitious goals in our nation's history – landing a man on the surface of the Moon and returning him safely to Earth. Built by visionaries, innovators, and history makers, our center not only met this audacious challenge, we blazed a trail of new discoveries that have spanned six decades. Kennedy is proud of the role we have played in the history of our nation and we continue to ignite space exploration and discovery for all - not just for today, but for the decades to come.

In 2022, our spaceport supported the most robust launch manifest in Kennedy's history and the center is on track for an even busier 2023, illustrating why we are America's premier spaceport. Crewed flights are launching to the International Space Station at a regular cadence. Kennedy supported operational crew rotation missions Crew-3 and Crew-4, as well as commercial resupply missions through the Commercial Crew Program. NASA and Boeing also successfully completed Orbital Flight Test-2, bringing the agency one step closer to having redundant crew access to and from low-Earth Orbit.

This year was also dubbed "The Year of Science," as the Launch Services Program supported a range of Earth science missions that aim to benefit humanity by teaching us more about our planet and universe. The Lucy mission launched on a 12-year journey to study Jupiter's Trojan asteroids and asteroid belt. The Double Asteroid Redirection Test, or DART, launched to a non-threatening asteroid to test out a planetary defense mission, and successfully made impact with the target 10 months later. IXPE, short for Imaging X-ray Polarimetry Explorer, launched in partnership with the Italian Space Agency and helps measure the polarization of cosmic X-rays. And the National Oceanic and Atmospheric Administration partnered with NASA to launch the latest Geostationary Operational Environmental Satellite to join the existing series of Earth-monitoring satellites that help agencies monitor and predict severe weather.

In March of this year, after undergoing months of integration and testing by the Exploration Ground Systems program, Orion and the Space Launch System rocket made the four-mile trek from the Vehicle Assembly Building to Launch Pad 39B for a wet dress rehearsal ahead of its maiden flight. As we closed out the fiscal year, teams across the center and agency were in breathless anticipation of the launch of Artemis I, the first mission in an increasingly complex launch campaign that will return humans to the lunar surface. Through Artemis missions, the first woman and first person of color will stand on the Moon and establish a long-term human presence, as we learn to live and work in deep space and prove the systems that will sustain life on our next giant leap to Mars and beyond.

In support of these missions, teams in the Exploration, Research, and Technology Programs (ER&T) are hard at work developing the technologies that will enable lunar habitation. NASA's Mass Spectrometer observing lunar operations, or MSolo, is a commercial off-the-shelf mass spectrometer modified to work in space, which will help the agency analyze lunar landing sites and study water on the Moon. Food and oxygen generation, waste mitigation, and new regolith-based construction material systems will all be vital to preparing for future Artemis missions, and ER&T is leading the way on developing these new technologies.

In 1962, Kennedy's workforce was working toward the dream of putting a person on the Moon. Not only did they reach that milestone, but they began to dream bigger. In the decades since then, NASA has continued to push the boundaries of science and exploration. Today, we are dreaming bigger and going farther than ever before.

With our eyes set on Mars and the universe beyond, Kennedy Space Center is more committed than ever to building on the legacy of the work that has gone before us as we continue to launch humanity's future.

Embrace the Challenge,

Janet Petro

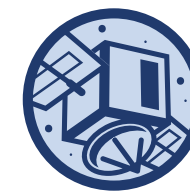
Vision

Igniting space exploration
and discovery for all.



Mission

Provide continuous access to space
from Earth's premier spaceport through
creativity and innovation.



Launching Humanity's Future



Top 20 Significant Events

OCTOBER 2021

Lucy First to Study Ancient Asteroids

A United Launch Alliance Atlas V rocket blasted off from Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida on Oct. 16, 2021, carrying NASA's Lucy spacecraft. The Lucy mission will explore the Trojan asteroids, which hold clues to the formation of our solar system.



OCTOBER 2021 SLS Stacking Complete

Engineers and technicians successfully secured NASA's Orion atop the fully assembled Space Launch System, completing stacking of the agency's mega-Moon rocket and spacecraft that will launch the next generation of deep space operations, including Artemis missions on and around the Moon.



NOVEMBER 2021

Crew-3 Lifts off From Kennedy

NASA astronauts Raja Chari, Tom Marshburn, and Kayla Barron, along with ESA (European Space Agency) astronaut Matthias Maurer soared into the night sky aboard a SpaceX Crew Dragon spacecraft and Falcon 9 rocket on Nov. 10, 2021. They lifted off from Kennedy Space Center's Launch Complex 39A on NASA's SpaceX Crew-3 mission to the International Space Station, returning to Earth after 177 days in space.

NOVEMBER 2021 DART Launches From West Coast

A SpaceX Falcon 9 rocket carrying NASA's Double Asteroid Redirection Test (DART) spacecraft launched from Space Launch Complex 4 at Vandenberg Space Force Base in California on Nov. 24, 2021.



NOVEMBER 2021

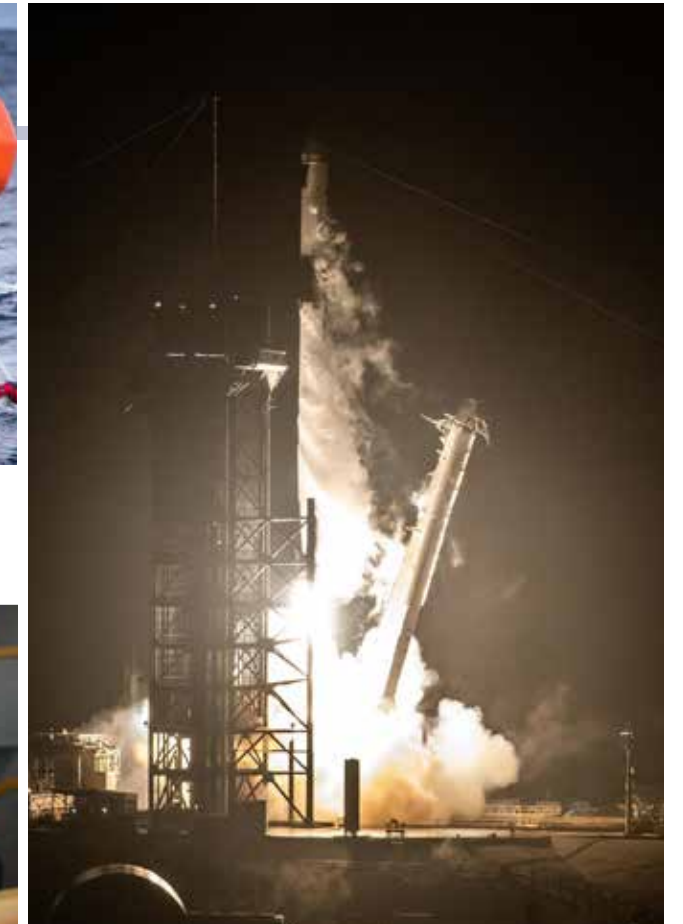
Recovery Team Certified for Artemis

After the successful completion of the ninth recovery test at sea, NASA's Landing and Recovery team became certified to recover the Orion spacecraft for the Artemis I mission.



DECEMBER 2021 Artemis I Team Completes Key Simulation

Launch Director Charlie Blackwell-Thompson and dozens of launch team members from NASA and contractor companies met for a joint launch countdown and ascent simulation at Kennedy Space Center. The successful completion of the critical event certified the Kennedy launch team as ready before the inaugural flight of NASA's Space Launch System rocket and Orion spacecraft for the Artemis I launch.



DECEMBER 2021

CRS-24 Delivers Critical Science

SpaceX's 24th commercial resupply services mission lifted off Dec. 21, 2021, from Kennedy Space Center's Launch Complex 39A. Launching aboard a SpaceX Falcon 9 rocket, the Dragon spacecraft delivered more than 6,500 pounds of science and research experiments, crew supplies, and vehicle hardware to the space station.

DECEMBER 2021 IXPE Studies Universe Extremes

NASA's Imaging X-ray Polarimetry Explorer (IXPE) spacecraft, the agency's first dedicated mission to measuring X-ray polarization, lit up the early morning Florida sky on its liftoff from Kennedy Space Center's Launch Complex 39A at 1 a.m. EST on Dec. 9, 2021. IXPE will study some of the most mysterious and extreme objects in the universe during its two-year primary mission.



MARCH 2022
GOES-T Satellite Soars

On March 1, 2022, the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite-T (GOES-T) satellite soared off the launch pad on a United Launch Alliance Atlas V 541 rocket at Cape Canaveral Space Force Station. The mission is a joint effort with NASA to help meteorologists observe and predict severe weather events.



APRIL 2022
Axiom 1, a First-of-its-Kind Mission
Axiom Space astronauts Michael López-Alegría, Larry Connor, Eytan Stibbe, and Mark Pathy launched April 8, 2022, and returned safely to Earth 16 days later, splashing down in the Atlantic Ocean off the coast of Florida. The return marked the end of the Axiom Mission 1 – the first private astronaut mission to the International Space Station.



MARCH 2022
Artemis I Rolls Out for First Rehearsal

NASA's Space Launch System (SLS) rocket and Orion spacecraft for the Artemis I mission rolled out to Launch Complex 39B for the first time on March 17, 2022, arriving after a nearly 11-hour journey from the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida. Engineers and technicians prepared SLS for its final major test – the wet dress rehearsal.



APRIL 2022
Seed Film Success in Space

Samples from lettuce grown on the International Space Station returned to Earth for analysis showed that a new seed film, developed by plant researchers at Kennedy Space Center, may one day help feed astronauts on long-duration space missions.



APRIL 2022
Crew-4 Heads to Space Station

On April 27, 2022, NASA astronauts Kjell Lindgren, Bob Hines, and Jessica Watkins, along with ESA (European Space Agency) astronaut Samantha Cristoforetti, blasted off from Kennedy Space Center's Launch Complex 39A and embarked on their journey to the International Space Station on NASA's SpaceX Crew-4 mission.



JUNE 2022
CAPSTONE Sets Path for Gateway
The Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment, or CAPSTONE, mission launched on Rocket Lab's Electron rocket on June 28, 2022, from the Rocket Lab Launch Complex 1 on the Mahia Peninsula of New Zealand.



MAY 2022
Boeing's OFT-2 Triumphs

Boeing's CST-100 Starliner spacecraft launched on a United Launch Alliance Atlas V rocket to the International Space Station on May 19, from Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida. The uncrewed Orbital Flight Test-2 was part of NASA's Commercial Crew Program.



JUNE 2022
Kennedy Turns 60

The NASA Kennedy Space Center senior leaders and employees celebrated the center's 60th anniversary with a "Cheers to 60 Years" cake and non-alcoholic toast in the Central Campus Headquarters on June 28, 2022.



JUNE 2022
Artemis Completes Booster Test, Wet Dress Rehearsal

At Kennedy Space Center's Launch Pad 39B, teams successfully conducted a test of the thrust vector control system on each of the twin solid rocket boosters of the Space Launch System for Artemis I. The test was a follow-on to the wet dress rehearsal, which simulates every stage of launch – minus the rocket leaving the pad.



JULY 2022
CRS-25 Lights up Space Coast

A SpaceX Dragon launched on a Falcon 9 rocket on July 14, 2022, from Kennedy Space Center's Launch Pad 39A for the company's 25th commercial resupply services mission for NASA. The spacecraft delivered more than 5,800 pounds of science experiments, crew supplies, and other cargo to the International Space Station.

AUGUST 2022
Artemis I Moon Rocket Arrives at Launch Pad

On Aug. 17, 2022, NASA's Space Launch System rocket and Orion spacecraft for the Artemis I mission arrived atop Launch Complex 39B at the agency's Kennedy Space Center in Florida after a nearly 10-hour journey from the Vehicle Assembly Building. The launch team attempted two previous liftoffs that were scrubbed, and Hurricane Ian thwarted a third attempt in September.



SEPTEMBER 2022
DART Makes Impact

After 10 months flying in space, NASA's Double Asteroid Redirection Test (DART) – the world's first planetary defense technology demonstration – successfully impacted Dimorphos, its asteroid target, on Sept. 26, 2022. The demonstration was the agency's first attempt to change an asteroid's motion in space.

Sandhill cranes pose in front of the Central Campus Headquarters (CCHQ) Building at NASA's Kennedy Space Center in Florida on Jan. 11, 2022.
Photo credit: NASA/Ben Smegelsky





TITUSVILLE



America's Premier Multiuser SPACEPORT

105 ACTIVE PARTNERS WITH
232 AGREEMENTS AND COUNTING

NOTICE OF AVAILABILITY 2022

Kennedy Space Center released an updated Notice of Availability (NOA) for undeveloped land identified in the Master Plan to support activities in launch operations, assembly, testing and processing, renewable energy, research and development, support services, and vertical launch & landing. The announcement is part of Kennedy's multiuser spaceport objectives and is based on effectively using land suitable for new development. This NOA has been extended from 2022 to 2024. Interested parties can respond to the NOA anytime during the open period.

COLLABORATION IN STEM EDUCATION

Kennedy Space Center developed an agreement with Oak Ridge Associated Universities that enables collaboration to broaden access to, and participation in, STEM (science, technology, engineering, math) education and research opportunities. The agreement supports students traditionally underrepresented in STEM fields and underserved by federal government, placing particular emphasis on working with Historically Black Colleges and Universities, Hispanic-Serving Institutions, and Minority-Serving Institutions, as part of a larger effort to develop institutional capacity for scientific research.

TELEMETRY CAPABILITY

Kennedy Space Center and the United States Space Force executed interagency agreements to enable the Space Force to install and operate "plug and play" power and fiber connectivity nodes designed for mobile assets to receive launch vehicle telemetry data. The nodes are intended for short-term use by government and commercial partners. Installation of these nodes supports the Space Force's "Range of the Future."

KSC MASTER PLAN

Kennedy's updated Master Plan will build off the center's 2021 Future Development Concept (FDC) that identified projects to support the immediate success of NASA programs while enabling the success of the agency's long-term future missions. While the FDC consists of larger-scale strategies to support NASA and commercial partner operations over the next 20 years, the updated Master Plan will provide a more detailed regulatory framework that can serve as a blueprint for how the center can continue its evolution as a multiuser spaceport.

VEHICLE ASSEMBLY BUILDING HIGH BAY AVAILABILITY

Kennedy Space Center published an Announcement for Proposals seeking proposals from U.S. commercial launch providers, interested in using the Vehicle Assembly Building High Bay 1 for launch operations, including ground operations, prelaunch integration, checkout, and spacecraft or payload testing. Based on the proposals received, NASA may select a partner to lease High Bay 1.

FIRST ALL-PRIVATE ASTRONAUT FLIGHT TO INTERNATIONAL SPACE STATION

Kennedy Space Center signed a Space Act Agreement with Axiom Space for spaceport operations and integration support for the Ax-1 mission and future mission requirements. The Ax-1 mission launched on April 8, 2022, from Kennedy Space Center launch complex 39A on a SpaceX Falcon 9 launch vehicle carrying the four private astronauts on board the Crew Dragon Endeavour capsule.

SPACE LIFE SCIENCES RESEARCH

A renewed Space Act Agreement between Kennedy Space Center and Florida Institute of Technology enables collaborative research and technology development across a wide range of potential research projects. One current joint research project studies the use of agriculturally accurate lunar and Martian regolith simulants to evaluate the challenges associated with using regolith as a potential growth substrate for food production on the Moon and Mars.



Merritt Island
National Wildlife Refuge
Visitor Information Center



National Park Service
Playalinda Beach

SR 402
SR 3

Gate 4



Launch and Landing Facility

LC-39B

VAB

SLS
& CLEAN
PAD

SPACEX

LC-39A

LC-48

ULA

LC-41



SPACEX



FLORIDA POWER & LIGHT



Gate 3

KSC
Industrial
Area

ONEWEB

SPACE LIFE SCIENCES LAB



FIREFLY



BLUE ORIGIN

Gate 2



SR 405

Indian River Bridge



Indian River

SR 3

MERRITT
ISLAND

Banana River

CCSFS

PARTNERSHIP
LAND/ASSETS

GOVERNMENT USE
LAND/ASSETS

Commercial Crew Program

Together with commercial partners Boeing and SpaceX, NASA's Commercial Crew Program (CCP) is delivering on its goal to provide safe, reliable, and cost-effective human space transportation to and from the International Space Station. CCP is enabling NASA to maximize station utilization while highlighting the benefits of NASA's commercial model with industry.

Among the accomplishments this fiscal year, NASA and Boeing completed a successful uncrewed flight test, known as Orbital Flight Test-2 (OFT-2) and made significant progress toward a crewed flight. For OFT-2, Boeing's CST-100 Starliner spacecraft launched on a United Launch Alliance Atlas V rocket to the International Space Station on May 19, 2022, from Space

Launch Complex-41 at Cape Canaveral Space Force Station in Florida. OFT-2 was designed to test the end-to-end capabilities of the crew-capable system. Starliner undocked from the space station and landed at White Sands Space Harbor in New Mexico on May 25.

The spacecraft spent about five days docked to the microgravity laboratory, six days total in space, orbited the Earth 94 times, and covered a total distance of 2,467,406 miles. Starliner completed all flight test objectives and mission operations demonstrations, including the ability to execute a hold, retreat, or abort if needed once in the vicinity of the space station. The spacecraft had a normal launch, controlled trajectory, orbital insertion, and approach, rendezvous, and docking with the space station.



A SpaceX Falcon 9 rocket carrying the company's Dragon spacecraft Freedom is launched on NASA's SpaceX Crew-4 mission to the International Space Station with NASA astronauts Kjell Lindgren, Robert Hines, Jessica Watkins, and ESA (European Space Agency) astronaut Samantha Cristoforetti onboard April 27, 2022, at NASA's Kennedy Space Center in Florida. The crew launched from Launch Complex 39A at Kennedy to begin a six-month mission onboard the orbital outpost. Photo Credit: NASA/Joel Kowsky

A United Launch Alliance Atlas V rocket lifts off on May 19, 2022, from Space Launch Complex-41 at Cape Canaveral Space Force Station in Florida for NASA Boeing's uncrewed Orbital Flight Test-2 (OFT-2) for the agency's Commercial Crew Program.





The Crew Dragon spacecraft for NASA's SpaceX Crew-3 mission arrives at the hangar at Kennedy Space Center's Launch Complex 39A in Florida on Oct. 24, 2021. The capsule, named Endurance by the crew, arrived at the launch complex after making the short journey from its nearby processing facility at Cape Canaveral Space Force Station.

flight count to five crewed missions for NASA. These launches continued to see more reuse components on Dragon certified by Commercial Crew.

When Crew-3 launched on Nov. 10, 2021, it executed the first reuse of a Crew Dragon nosecone and the first indirect crew handover, which occurred between the Crew-3 and Crew-2 missions due to a two-day gap between spacecraft departure and arrival. Direct handover between crews is the preferred method, but the teams made quick safety decisions for launch and return based on weather, which was performed flawlessly by both the ground operations teams and the international crew aboard station.

Launched on April 27, 2022, the Crew-4 spacecraft Freedom was the first to fly on a fourth flight booster, a first for CCP and a significant accomplishment for the team and industry.

Another first, NASA astronaut Nicole Mann will become the inaugural female commander of a commercial crew mission when she serves in that role for Crew-5, scheduled to launch in October 2022.

To date, two international partners have flown astronauts on a SpaceX crewed mission – JAXA (Japan Aerospace Exploration Agency) and ESA (European Space Agency). Moving into next year, that number will boost to four with a Roscosmos cosmonaut on Crew-5 and a UAE (United Arab Emirates) astronaut on Crew-6 in spring 2023.

With NASA's extension of the International Space Station to 2030, there is a need for additional crew rotation missions to maintain a safe and sustainable flight cadence, achieve a dissimilar redundancy, continue safe space station operations, and allow Boeing and SpaceX to work through any unforeseen issues that could arise as private industry builds operational experience with these new systems. To meet these goals throughout the remainder of the space station's planned operations, NASA awarded SpaceX eight additional crewed flights to the orbiting laboratory as part of its Commercial Crew Transportation Capabilities (CCtCap) contract. Once the Starliner system is certified, NASA intends to rotate Boeing and SpaceX missions once per year.

Commercial Crew's Suborbital Crew (SubC) office continues to develop strategies for enabling NASA researchers and hardware developers to fly aboard future commercial suborbital spaceflights. The team continues to meet

Starliner's subsystems performed as needed, such as its environmental control and life support, landing, power, guidance navigation and control, docking, and ascent abort emergency detection system validation and atmospheric entry with aero-deceleration.

Preparations, including spacecraft refurbishments and system checkouts, are ongoing for NASA's Boeing Crew Flight Test (CFT), Starliner's first flight with astronauts. Targeted for early 2023, CFT will transport a crew of NASA astronauts to the space station, where they will live and work for about two weeks. Following a successful CFT mission, NASA will begin the final process of certifying the Starliner spacecraft and systems for regular crew rotation missions to the space station.

SpaceX maintained a steady cadence of crewed missions to the space station and achieved many firsts. By the end of the fiscal year, the company had launched two missions with astronauts, boosting CCP's total

with potential partners to distribute lessons learned, conduct knowledge transfers, and determine the appropriate safety assessments for future NASA crews and payloads. This work will allow NASA to finalize the agency's plans for purchasing seats on commercial suborbital space transportation systems in the future. 🧑🏽

Boeing's CST-100 Starliner approaches the International Space Station on the company's Orbital Flight Test-2 mission before automatically docking to the Harmony module's forward port.



ESA (European Space Agency) astronaut Matthias Maurer gives a thumbs up after being helped out of the SpaceX Dragon Endurance spacecraft onboard the SpaceX Shannon recovery ship after he and NASA astronauts Raja Chari, Kayla Barron, and Tom Marshburn landed in the Gulf of Mexico off the coast of Tampa, Florida, May 6, 2022. Photo credit: NASA/Aubrey Gemignani



Boeing and NASA teams work around Boeing's CST-100 Starliner spacecraft after it landed at White Sands Missile Range's Space Harbor in New Mexico on May 25, 2022. Boeing's Orbital Flight Test-2 (OFT-2) is Starliner's second uncrewed flight test to the International Space Station as part of NASA's Commercial Crew Program. Photo credit: NASA/Bill Ingalls

Launch Services Program



Workers inside the Astrotech Space Operations Facility in Titusville, Florida, move the first half of the United Launch Alliance (ULA) payload fairing toward NASA's Lucy spacecraft on Sept. 30, 2021. Photo credit: NASA/Ben Smegelsky

NASA's Launch Services Program (LSP), based at Kennedy Space Center in Florida, unites scientific and robotic spacecraft customers' needs with the appropriate rocket, managing the process to ensure the spacecraft is placed in orbit around the Earth, the Sun, or powered to destinations deeper into the solar system. LSP assists customers who need specialized, highly technical support worldwide and enables some of NASA's greatest scientific missions and technical achievements.

LSP works closely with established launch providers and fosters emerging providers to ensure NASA has the appropriate mix of launch capabilities that can support any agency payload, ranging from the largest and most advanced scientific probes exploring the solar system to tiny CubeSats built by students across the nation.

Additionally, LSP serves in a consulting role for important missions across the agency, including NASA's return to the Moon through the Artemis missions, the launch of the James Webb Space Telescope, and both commercial crew and commercial resupply flights to support operations on the International Space Station. LSP has advised on the Gateway Logistics Element, the Human Landing System, the Habitation and Logistics Outpost, and the Power and Propulsion Element, as well as continues to provide mission management to deliver the Canadian Deep Space Exploration Robotic System to the Gateway.

In fiscal year 2022, LSP managed the launch services for four primary missions that launched from both coasts of the United States. On Oct. 16, 2021, NASA's Lucy mission, the agency's first to Jupiter's Trojan asteroids, launched on a United Launch Alliance (ULA) Atlas V rocket from Space Launch Complex (SLC) 41 at Cape Canaveral Space Force Station in Florida, sending the spacecraft, named for the fossilized skeleton of one of the earliest known hominin ancestors, to explore eight asteroids, which are "fossils" of planetary formation.

NASA's Double Asteroid Redirection Test (DART), the world's first full-scale mission to test technology for defending Earth against potential asteroid or comet hazards, launched on Nov. 23, 2021, aboard a SpaceX Falcon 9 rocket from SLC-4 East at Vandenberg Space Base in California. DART was the first interplanetary mission flown on a Falcon 9, and the first LSP mission to fly on a previously flown first-stage rocket booster.

On Dec. 9, 2021, NASA's Imaging X-Ray Polarimetry Explorer (IXPE) mission launched on a SpaceX Falcon 9 rocket from Launch Complex 39A at Kennedy. IXPE was a joint effort with the Italian Space Agency designed to measure the polarizations of X-rays from a variety of celestial objects, including the remnants of supernova explosions, black holes, and more, to better understand how they work.

LSP also worked with ULA to launch the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite-T (GOES-T) satellite on March 1, 2022. GOES-T lifted off on a ULA Atlas V 541 rocket from Cape Canaveral Space Force Station. This is the third satellite in the GOES-R series — a collaborative program between NASA and NOAA. The GOES satellite network helps meteorologists observe and predict local weather events that affect public safety, including thunderstorms, tornadoes, fog, hurricanes, flash floods, and other severe weather.

LSP also manages the launch services for smaller payloads through the Venture Class Launch Services (VCLS) Demo 2 contracts. These contracts enable the launch of small satellites selected through NASA's CubeSat Launch Initiative. LSP supports the agency's CubeSat Launch Initiative by providing launch opportunities for CubeSats that are awaiting a ride to space. These VCLS Demo 2 launches of small satellites can tolerate a higher level of risk than primary missions. This capability will demonstrate and mitigate the risks associated with the use of new launch vehicles, providing access to space for future small spacecraft and missions.

On Jan. 26, 2022, NASA announced the selection of 12 commercial companies to provide launch services for the agency's Venture-Class Acquisition of Dedicated and Rideshare (or VADR) missions. The VADR contract will provide a broad range of FAA-licensed commercial launch services capable of launching payloads ranging from CubeSats to high risk tolerance missions on newer launch vehicle configurations to a variety of orbits. VADR builds on previous procurement efforts such as the VCLS, CAPSTONE, VCLS Demo 2, and TROPICS contracts. Managed by NASA's Launch Services Program, these contracts provide new opportunities for science and technology payloads while fostering America's growing commercial launch market. 🚀



A SpaceX Falcon 9 rocket launches with NASA's Imaging X-ray Polarimetry Explorer (IXPE) spacecraft onboard from Launch Complex 39A on Dec. 9, 2021, at NASA's Kennedy Space Center in Florida. Photo credit: NASA/Joel Kowsky



The first half of the United Launch Alliance Atlas V payload fairing is moved toward the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite-T (GOES-T) inside the Astrotech Space Operations facility in Titusville, Florida, on Feb. 7, 2022. Photo credit: NASA/Ben Smegelsky

Right: The SpaceX Falcon 9 rocket with NASA's Double Asteroid Redirection Test, or DART, spacecraft onboard, is seen during sunrise on Nov. 23, 2021, at Space Launch Complex 4E at Vandenberg Space Force Base in California. Photo credit: NASA/Bill Ingalls



Top left: Technicians remove the wrapping from NASA's Double Asteroid Redirection Test (DART) spacecraft that protected it during transport to the Astrotech Space Operations Facility at Vandenberg Space Force Base in California on Oct. 4, 2021. Photo credit: USSF 30th Space Wing/Aaron Taubm

Top right: NASA's Lucy spacecraft is moved from the Work Processing Cell to the Airlock inside the Astrotech Space Operations Facility in Titusville, Florida, on Sept. 29, 2021. Photo credit: NASA/Ben Smegelsky



Bottom left: A close-up view of the first-stage engines as the United Launch Alliance Atlas V 541 rocket, carrying the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite-T (GOES-T), lifts off from Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida on March 1, 2022. Photo credit: NASA/Kevin Davis and Kevin O'Connell

Bottom right: A SpaceX Falcon 9 rocket with NASA's Imaging X-ray Polarimetry Explorer (IXPE) spacecraft begins rollout to Launch Complex 39A at NASA's Kennedy Space Center in Florida on Dec. 7, 2021. Photo credit: SpaceX

Artemis

At the beginning of the fiscal year, Exploration Ground Systems, along with primary contractor Jacobs, placed the Orion spacecraft atop the Space Launch System (SLS) rocket inside the Vehicle Assembly Building (VAB) — completing the assembly of the Artemis I Moon rocket. After assembly was complete, the team prepared to roll the rocket and spacecraft in March to the launch pad for the final prelaunch test: the wet dress rehearsal.

During this test series, the launch team ran through the paces just like they would on launch day, filling the rocket with over 700,000 gallons of propellant and stopping the countdown just seconds before T-0. The test was not without its challenges. Teams encountered issues such as hydrogen leaks, faulty check valves, and extreme weather challenges, along with external impacts. The launch team rolled the rocket and spacecraft back into the VAB for repairs and returned to the launch pad to complete the rehearsal.

In order to get the rocket and spacecraft to the launch pad, it was

transported on crawler-transporter 2, which carried Saturn V rockets and space shuttles to their destinations. Though it was originally constructed for the Apollo program, the transporter and the crawlerway it travels down were tested and upgraded to support the weight of the 5.75-million-pound Moon rocket.

This was not the only time the launch team practiced a launch countdown. Throughout the fiscal year, the launch team convened at their consoles inside the Launch Control Center to practice various scenarios of what they could experience on launch day. This also included the wet dress rehearsal and cryogenic demonstration tests performed while the rocket and spacecraft were at the launch pad. Teams were able to work through simulated and real-time issues while performing tanking operations on the rocket.

Ground systems teams also practiced their processes and procedures ahead of the Artemis I mission. In the fall of 2021, members of NASA's Landing and Recovery team, who are based at Kennedy Space Center, traveled to

Naval Base San Diego to conduct their ninth in a series of offshore tests with the Navy to ensure the joint team is ready to safely retrieve the Orion capsule after it splashes down in the Pacific Ocean.

Teams attempted to launch SLS and Orion twice and completed a successful cryogenic tanking test before facing a hurricane approaching the Central Florida area. Managers made the decision to return the rocket and spacecraft to the VAB ahead of the storm to ensure it remained in a safe configuration until the storm passed.

Although Artemis I was delayed, teams at Kennedy are continuing to prepare for the next Artemis missions, which will be crewed. At Launch Pad 39B, engineers and technicians are preparing to install a crew egress system to ensure astronauts can safely get away from the rocket in case there is an emergency on launch day.

In addition to the ground system enhancements for crewed missions, the NASA and Lockheed Martin teams at Kennedy are working to complete the assembly of the Artemis II spacecraft, which will carry four astronauts around the Moon. The teams also are outfitting the Artemis III crew module for its flight to take astronauts to the surface of the Moon. The recovery team is working on how they will quickly retrieve astronauts after they safely return to Earth.

On March 31, 2022, Canoo Technologies Inc., was awarded the contract to design and provide the next generation of crew transportation vehicles for the Artemis crewed missions. Leadership teams from Canoo, Kennedy, and the Astronaut Office at Johnson Space Center collaborated to complete



Technicians inside the Neil Armstrong Operations and Checkout Building power on the Orion crew module for the Artemis II mission, which will carry crew, for the first time at NASA's Kennedy Space Center in Florida on May 27, 2022. Photographer: NASA/Kim Shiflett



Prototypes of the crew transportation vehicle (CTV) for Artemis crewed missions are driven out to Launch Complex 39B at NASA's Kennedy Space Center in Florida on May 11, 2022. Canoo Technologies Inc., was awarded a contract to design and provide the next generation of CTVs for the Artemis crewed missions. Representatives with Canoo were at the spaceport demonstrating the environmentally friendly fleet of vehicles. Artemis II will be the first Artemis mission flying crew aboard Orion. Photo credit: NASA/Kim Shiflett3



With wildflowers surrounding the view, NASA's Artemis I Moon rocket – carried atop the crawler-transporter 2 – arrives at Launch Pad 39B at the agency's Kennedy Space Center in Florida on June 6, 2022. Photo credit: NASA/Ben Smegelsky



the interior and exterior design of the environmentally friendly vehicles. The three vehicles will be provided to NASA in the summer of 2023.

To help support future, longer-duration Artemis missions, Kennedy's Deep Space Logistics (DSL) project office continues leading the development of the deep space commercial supply chain to the Moon, Mars, and beyond. During the past fiscal year, the project continued its work in support of Gateway – the critical outpost to be built in orbit around the Moon to support Artemis.

DSL continued collaboration with NASA's international partners, including the Canadian Space Agency (CSA) on the delivery of the Gateway External Robotic System, as well as with the Japan Aerospace Exploration Agency (JAXA) on investigating enhancements to its HTV-X cargo resupply spacecraft for use in Gateway. Special studies and early design formulation activities continued between DSL and its first commercial vendor, SpaceX. 🚀

IMAGES TOP TO BOTTOM

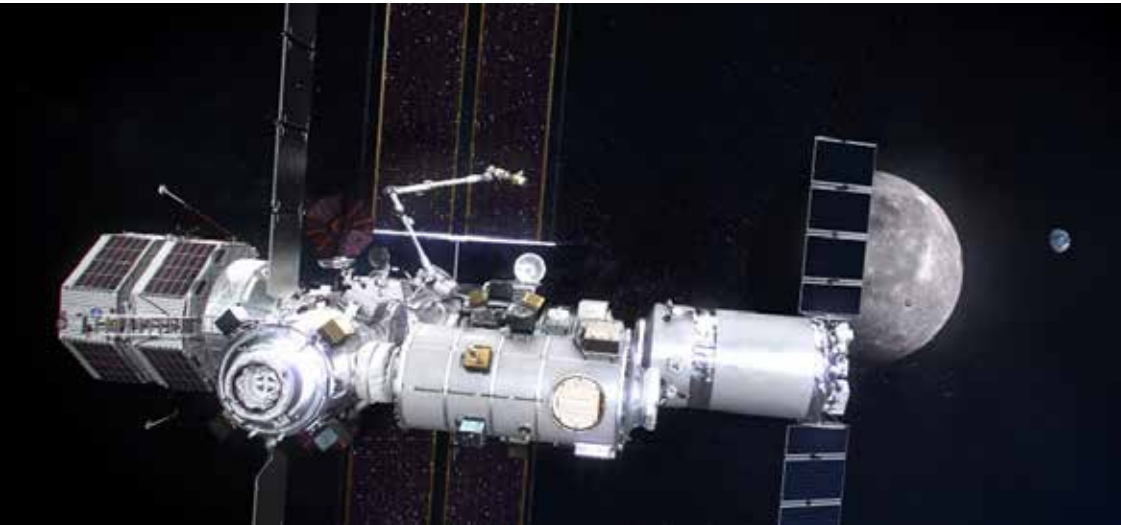
Vice President Kamala Harris visits with NASA astronauts Victor Glover, at left, and Randy Bresnik, at right, during Artemis I launch countdown activities on Aug. 29, 2022, at the agency's Kennedy Space Center in Florida. The launch was waved off for the day. Photo credit: NASA/Ben Smegelsky

A family wearing NASA and Artemis shirts are on the Max Brewer Bridge in Titusville, Florida, to witness the launch of NASA's Artemis I mission on Aug. 29, 2022. The launch was waved off for the day. Photo credit: NASA/Steven Scifer

Artemis I Launch Director Charlie Blackwell-Thompson monitors launch countdown events inside Firing Room 1 of the Rocco A. Petrone Launch Control Center at NASA's Kennedy Space Center in Florida on Sept. 3, 2022. Launch of the agency's Space Launch System and Orion spacecraft from Kennedy's Launch Complex 39B was waved off due to an issue during tanking. Photo credit: NASA/Kim Shiflett



Moonikin Commander Campos will be on board Artemis I along with two phantom manikins, Helga and Zohar, which will allow NASA to measure radiation, acceleration, and vibration data throughout the mission. The information gathered from these human body replicas will inform future crewed Artemis missions. Photographer: NASA/Frank Michaux



Artist rendering of NASA's Gateway lunar orbiting outpost with the CSA GERS robotic arm.



Crawler transporter-2 approaches the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida on June 1, 2022, in support of the Artemis I mission. The crawler will carry the Space Launch System with the Orion spacecraft atop on the mobile launcher to Kennedy's Launch Complex 39B. Photographer: NASA/Kim Shiflett

Exploration Research and Technology

Throughout fiscal year 2022, NASA's Kennedy Space Center Exploration Research and Technology Programs (ER&T) continued to provide the International Space Station with ground operations, logistics, and maintenance support while the program pushed the boundaries of research and technology development to help meet the agency's needs.

Throughout the year, ER&T provided utilization and logistical support to the space station by aiding with the rapid return of science from the orbiting lab for three commercial resupply services missions – allowing for researchers to analyze data quickly with minimal loss of microgravity effects.

In addition, the team supported multiple biological research projects both during ground preparations and aboard the space station. Working closely with astronauts Shane Kimbrough, Thomas Pesquet, Megan McArthur, and Mark Vande Hei, NASA grew Hatch Chile peppers in the Advanced Plant Habitat. On Oct. 29, 2021, Vande Hei performed the first harvest of the peppers on the orbiting laboratory. The second and final harvest took place on Nov. 26, 2021. The astronauts aboard station enjoyed eating some of

the peppers harvested and packaged samples of the peppers, which were returned to Earth for analysis.

On Earth, Kennedy, in collaboration with the German Aerospace Center, conducted research in Antarctica to study agriculture in harsh, isolated, and controlled environments. This research will help inform NASA's efforts to feed astronauts in space as part of the agency's interest in human health, life support, and habitation systems. Additionally, scientists at Kennedy tested microgravity harvesting and containment approaches for microgreens (small nutritious, flavorful crop plants) in three parabolic flights.

Several subject matter experts from ER&T were involved with NASA challenges that solicited ideas and concepts from the public, including the Trash-to-Gas Challenge, the Break the Ice Lunar Challenge, and the Deep Space Food Challenge, which have sought out new ways to live and work on the Moon and beyond.

Throughout the year, teams continued to work on upcoming lunar missions and launches. ER&T worked to prepare four Mass Spectrometer

observing lunar operations (MSolo) units, which are destined to launch to the Moon aboard commercial lunar landers as part of the scientific and technical demonstrations for the agency. Another team prepared the Electrodynamic Dust Shield (EDS) for an upcoming lunar mission.

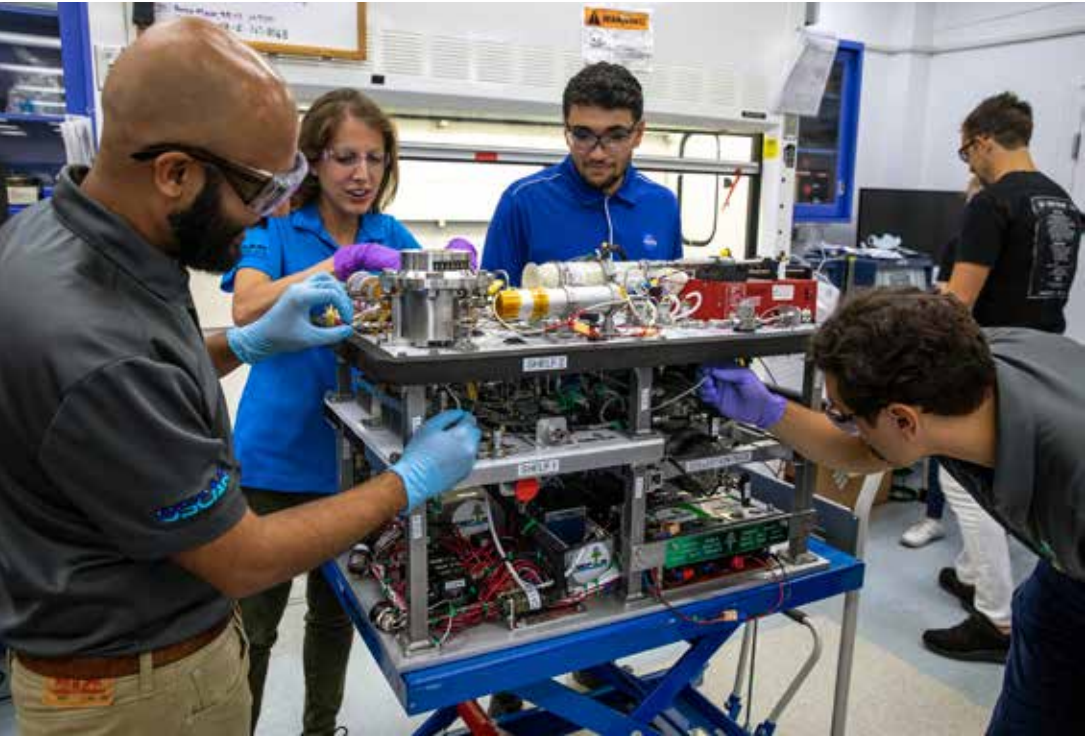


NASA astronaut and Expedition 65 Flight Engineer Mark Vande Hei prepares to photograph Chile peppers growing in the Advanced Plant Habitat as part of the Plant Habit-04 experiment being conducted aboard the International Space Station. The Chile pepper seeds started growing on July 12, 2021, and represent one of the longest and most challenging plant experiments attempted aboard the orbiting laboratory. Photo credit: NASA



Ten polar explorers, including a member of our Kennedy Space Center family, spent the Antarctic winter isolated at the German Neumayer III Station, operated by the Alfred Wegener Institute (AWI) – a process they call overwintering. Located a few hundred meters away from the Neumayer station is the EDEN-ISS crop production facility. EDEN-ISS not only serves as an extreme environment – remote analog simulating conditions astronauts will face during long-duration surface missions on Mars – but also as a test bed for crop production systems and operations that may one day be critical to establishing a permanent human presence beyond Earth. A collaboration between NASA and the German Aerospace Center (DLR) ensured they had fresh produce available all winter. Photo credit: NASA/Jess Buncek

The Trash to Gas team members prepare flight hardware for NASA's Orbital Syngas Commodity Augmentation Reactor (OSCAR) inside the Applied Chemistry Laboratory in the Neil Armstrong Operations and Checkout Facility at the agency's Kennedy Space Center in Florida. OSCAR began as an Early Career Initiative project at the spaceport that studies technology to convert trash and human waste into useful gasses such as methane, hydrogen, and carbon dioxide. By processing small pieces of trash in a high-temperature reactor, OSCAR is advancing new and innovative technology for managing waste in space. Photo credit: NASA/Kim Shiflett





A team at NASA's Kennedy Space Center in Florida assesses the Dust Concentration Monitor and the Millimeter Wave Doppler Radar inside a regolith bin at the Granular Mechanics and Regolith Operations (GMRO) lab at the spaceport's Swamp Works as part of Plume Surface Interaction (PSI) Instrumentation testing. The PSI Project is advancing both modeling and testing capabilities to understand exactly how rocket exhaust plumes affect a planetary landing site. This advanced modeling will help engineers evaluate the risks of various plumes on planetary surfaces, which will help them more accurately design landers for particular locations. Photo credit: NASA/Frank Michaux

Inside the Space Station Processing Facility at NASA's Kennedy Space Center in Florida, an engineer installs the Mass Spectrometer observing lunar operations (MSolo) onto its radiator bracket. This spectrometer is part of the PRIME-1 (Polar Resources Ice Mining Experiment-1) payload suite, slated to launch to the Moon in 2023 with Intuitive Machines. MSolo is a commercial off-the-shelf mass spectrometer modified to work in space and it will help analyze the chemical makeup of landing sites on the Moon, as well as study water on the lunar surface. Photo credit: NASA/Kim Shiflett

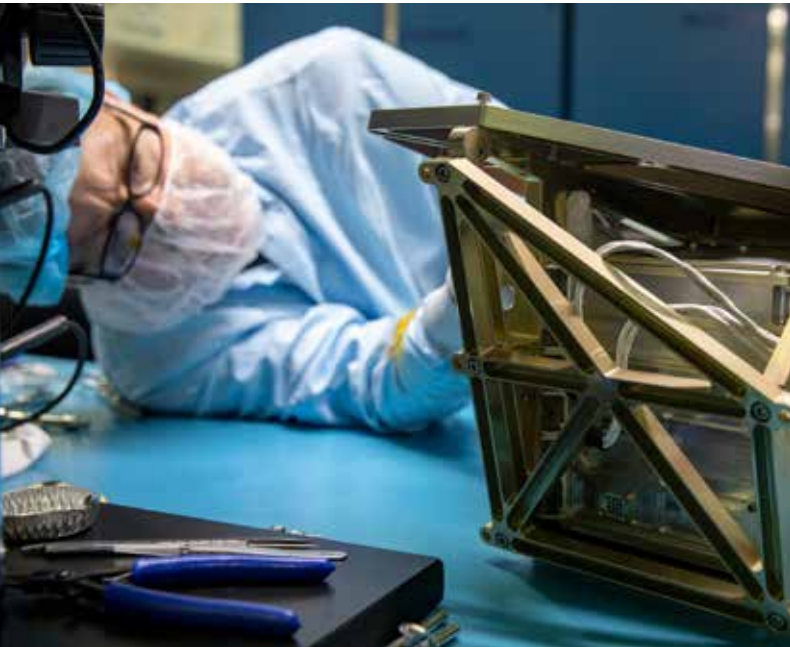
The EDS has numerous uses, including removing dust from spacecraft and equipment used in space exploration, such as solar panels, cameras, and radiators. The EDS technology will play a key role in mitigating dust, which has been a challenge in space exploration since the Apollo era.

Engineers and researchers at Kennedy also completed a second suborbital flight test for the Orbital Syngas Commodity Augmentation Reactor (OSCAR), advancing new and innovative technology for managing waste in space.

ER&T also worked to prepare and deliver the Biological Experiment 1 (BioExpt-1) payload for the Artemis I mission. The BioExpt-1 payload includes four science experiments designed to assess radiation effects on a variety of organisms (plant seeds, algae, fungi, and yeast) and will help researchers gain understanding of the levels and impacts of ionizing radiation on biological life forms like never before.

As part of NASA's mission to engage, educate, and inspire the public, ER&T provided 41 interns from 34 colleges, universities, and institutes with meaningful, hands-on experiences spanning opportunities, such as plant production and in-situ resource utilization.

As a result of the innovative research conducted under Kennedy's research and technology programs, 53 new technology reports were issued, and one new patent application was filed this fiscal year. Overall, Kennedy's research and technology efforts span 31 states and three countries through a variety of mechanisms including licenses, space act agreements, grants, and Small Business Innovative Research/Small Business Technology Transfer contracts. 🏠



Inside one of the labs at NASA's Kennedy Space Center in Florida, NASA Project Manager Dinah Dimapilis unboxes one of two container assemblies that will be used to carry the agency's Biology Experiment-1 on the Artemis I mission. Photo credit: NASA



A team member from the Granular Mechanics and Regolith Operations Lab operates a test of the ISRU Pilot Excavator in the regolith bin inside Swamp Works at NASA's Kennedy Space Center in Florida. The tests use a gravity assist offload system to simulate reduced gravity conditions found on the Moon. On the surface of the Moon, mining robots like the Pilot Excavator will excavate the regolith and take the material to a processing plant where usable elements such as hydrogen, oxygen, and water can be extracted for life support systems. Photo credit: NASA/Frank Michaux

Engineering

NASA Engineering at Kennedy Space Center provides engineering excellence in the design, development, and operations of launch vehicles, spacecraft, payloads, ground systems, and facilities. The team contributes to the Artemis missions through Exploration Ground Systems, Human Landing Systems, and Gateway's Deep Space Logistics. Engineers are embedded with the Commercial Crew Program, Launch Services Program, and Exploration Research and Technology programs. Additionally, the team supports the International Space Station, as well as Center Engineering, Safety, and Operations. In the next five years, Kennedy engineers will provide critical engineering leadership and support to more than 100 major milestones, 75 launches, and 15 different launch vehicle fleets, ensuring NASA's mission success.

Launch Services Program

Engineers successfully supported the launch of numerous scientific and technological missions including Lucy, Double Asteroid Redirection Test, and Imaging X-ray Polarimetry Explorer, across multiple launch sites on opposite coasts. The team replaced ductwork, humidifiers, and equipment at the Payload Hazardous Servicing Facility to increase the performance and reliability of the facility in advance of spacecraft arrivals, including Psyche and

future payloads. The partnership between Kennedy engineers and the Launch Services Program resulted in mitigating a significant risk to the processing and launch schedule of a one-of-a-kind spacecraft within a compressed nine-month schedule.

Commercial Crew Program

Kennedy engineers supported operations for SpaceX's Crew-2 landing, Crew-3 launch and landing, and Crew-4 launch. Additionally, engineering teams supported the launch and landing of Boeing's Operational Flight Test-2 (OFT-2) and continue to prepare for the upcoming launch of Boeing's Crewed Flight Test (CFT) mission. Engineers evaluated suborbital launch vehicles for flight worthiness to determine how these vehicles can best support the Commercial Crew Program. The team also assisted partners in the construction and evaluation of flight hardware, including composite heat shields and batteries.

Artemis

Engineers certified all ground systems required to process, operate, and launch NASA's Space Launch System (SLS) rocket and Orion spacecraft. The engineering team performed processing activities in the field and



Inside the Payload Hazardous Servicing Facility at NASA's Kennedy Space Center in Florida, the agency's Psyche spacecraft – recently removed from its shipping container and inside a protective covering – is moved by crane to a work stand on May 2, 2022. Photo credit: NASA/Frank Michaux



The Boeing CST-100 Starliner spacecraft is lifted at the Vertical Integration Facility at Space Launch Complex 41 at Florida's Cape Canaveral Space Force Station on May 4, 2022. Photo credit: NASA/Frank Michaux



Above: NASA's Space Launch System and Orion spacecraft atop the mobile launcher are in view in High Bay 3 of the Vehicle Assembly Building (VAB) at the agency's Kennedy Space Center in Florida on Aug. 16, 2022. Photo credit: NASA/Kim Shiflett

Left: Emissivity testing of Orion crew module thermal coatings by Materials and Processes personnel. Photo credit: NASA

Page opposite: Shown on Jan. 11, 2022, is the area formerly occupied by the headquarters building at NASA's Kennedy Space Center. This building is replaced at the Florida spaceport by the 200,000-square-foot, seven-story Central Campus Headquarters (CCHQ) Building. Photo credit: NASA/Ben Smegelsky



remote firing room, testing operations throughout the Artemis I processing flow. Engineers participated in program operational readiness reviews and conducted key milestone reviews for major events, concluding with a Certificate of Flight Readiness to assert engineering readiness for Artemis I launch. Key milestones included moving the Orion spacecraft out of the Multi-Payload Processing Facility, integration of SLS and Orion in the Vehicle Assembly Building, integrated testing of the Artemis I vehicle, and transporting the integrated vehicle to and from Launch Complex 39B (LC-39B). Kennedy engineers have been instrumental in developing ground support equipment and providing underway recovery test operations to ensure the Orion spacecraft recovery and transportation back to Kennedy upon completion of the Artemis I mission.

Laboratories, Development and Testing

The Laboratories, Development and Testing Division contributed to the success of missions and projects spanning several agency programs and customers, as well as numerous external aerospace business partners. Engineers performed assessments of the crawler-transporter 2, crew access arm, mobile launcher umbilical plates, and LC-39B lightning strike impacts on spacecraft and launch vehicles. The team's large-scale test article capabilities have been instrumental in testing vehicle support posts for mobile launcher 2 and cryogenic block valves with concurrent setup of the

Exploration Upper Stage umbilical and the Blue Origin New Glenn umbilicals. The division continued to provide multi-disciplinary engineering expertise to the International Space Station, Gateway, and Human Landing System Programs for the ground processing of elements, experiment payloads, and orbital replacement units.

Spaceport Support

The Construction of Facilities team completed projects to continue modernizing and enhancing the nation's premier spaceport. Demolition of the 439,000-square-foot former headquarters building, built in 1965, was completed. The team replaced fire pump #4, located in the Industrial Water Pumping Station, servicing Launch Complex 39A and 39B, with a tier 4 emissions-rated engine to meet environmental regulations while ensuring sufficient redundancy to support launch operations. Additionally, the team completed the construction and activation of a new water pump station that replaced the existing pump station, constructed in the 1960s. The new pump station is Kennedy's primary water connection to the City of Cocoa's water system, providing reliable control of water and enabling supplemental pressure and disinfection to Kennedy's potable water system. The team also completed projects on the Vehicle Assembly Building High Bay 3 Environmental Control System, LC-39B liquid hydrogen sphere, bridge, and shoreline protection projects. 🏗️

Spaceport Integration and Services

Spaceport Integration and Services supports all Government and Federal Aviation Administration-licensed launches from Kennedy Space Center and Cape Canaveral Space Force Station. It was a busy year with **36 launches and 22 other major events** like static fires. The **Emergency Operations Center activated more than 42 times** to support center operations.



Weather Instrumentation Engineer Nick O'Connor works with the Tropospheric Doppler Radar Wind Profiler at Kennedy Space Center in Florida during an Artemis I weather simulation on Nov. 3, 2021. Credit: NASA/Kim Shiflett

Launch Complex 39 & Roberts Road SpaceX Expansion

As a primary tenant, SpaceX will streamline work by consolidating to an enhanced worksite at Kennedy, including building a manufacturing site off Roberts Road as well as a new launch site within the perimeter of Launch Complex 39A. There is potential to expand on adjacent land at Roberts Road after the environmental impacts are assessed. In July, the interagency and public scoping period ended for the Environmental Assessment for the proposed Roberts Road expansion, which is one of the first steps of the National Environmental Policy Act review process. The process enables interested persons and organizations to provide input on potentially affected resources, environmental issues, and the agency's planned approach to the environmental-analysis process.

Tropospheric Doppler Radar Wind Profiler

Communication upgrades for the Tropospheric Doppler Radar Wind Profiler, which monitors upper atmosphere weather, were completed in May 2022. The instrument provides upper-level wind data from 6,000 to 62,000 feet every five minutes, and the data is used by NASA and other spaceport users during the launch countdown to assess vehicle aerodynamic loads. The wind profiler has been approved by NASA as the primary upper-level winds system for calculating aerodynamic loads for NASA's Artemis missions and Falcon 9 crew launches.



The Tropospheric Doppler Radar Wind Profiler (TDRWP), located at Kennedy Space Center, is the only instrument of its kind in operation on the Eastern Range. Consisting of 640 antennae and occupying five acres near the Launch and Landing Facility, the TDRWP operates at nearly 50 MHz. It will be used as a primary instrument to measure upper-level winds for NASA's Artemis missions, which will launch from the Florida spaceport. Credit: NASA/Kim Shiflett

FACILITIES AND INFRASTRUCTURE

In FY22, Spaceport Integration and Services completed nearly **600 task orders**, including facility related services, design, and construction projects, to ensure the spaceport has the capacity and reliability to support the multitude of Kennedy's programs and mission partners. The following projects are of note:

Launch Control Center Lobby Renovation

A renovation of the Launch Control Center lobby was completed in preparation for the Artemis I launch and to celebrate the renaming of the building to Rocco A. Petrone. Since 1965, every launch director and their staff have operated in the center for launches from pads 39A and 39B at Kennedy. The renovation included a new video wall, lighting, furnishings, paint, and plaques for every mission to signify the importance of the past leading into the future.



The newly renovated Rocco A. Petrone Launch Control Center lobby at NASA's Kennedy Space Center in Florida. Credit: NASA/John O. Schmidt



Crawlerway Grading

Smoothing the way for NASA's Space Launch System rocket, an optical guided motor grader combined with 3D topography modeling ensured the crawlerway river rock was at precision depth for Artemis I. The precise grading provided the stability, particularly on turns, that was crucial as the crawler transported Artemis I on its journey to Launch Pad 39B.

Vehicle Assembly Building Lighting Refurbishment

As part of an ongoing effort to provide a better work environment and save costs, LED fixtures are being installed to replace the original and failing light fixtures in the Vehicle Assembly Building (VAB). Built in 1966, the VAB currently houses the Space Launch System rocket.



A typical floor with renovated lighting in the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida. Credit: NASA/John O. Schmidt

ENVIRONMENT AND SUSTAINABILITY



Indian River Lagoon Health Initiative

As part of the Indian River Lagoon Health Initiative Plan, Kennedy conducted two seasonal surveys of seagrass, providing an indicator of water quality and ecosystem health; conducted 11 monthly surveys of wading birds, most of which are federally and state protected, providing indicators of habitat distribution and health; conducted 18 aerial surveys of manatees, which are a federally and state protected species; collaborated with the Florida Atlantic Coast Telemetry Network to track migration patterns (e.g. coastal sharks, turtles, and sportfish); initiated horseshoe crab spawning site and spoil island monitoring; and conducted two surveys of sea turtles and their health. Kennedy is also working on a seagrass planting project in the northern Banana River Lagoon.

As part of the KARS Park restoration project, led by NASA Kennedy Space Center's Spaceport Integration and Services organization, shoal grass is taking hold in the restoration area. Credit: NASA/Frank Michaux

KARS Park Shoreline Restoration

The restoration of approximately 3,500 feet of shoreline is nearing completion at the Kennedy Athletic, Recreation & Social (KARS) park on East Hall Road. Damage due to hurricanes and high-water conditions accelerated shoreline loss and exposed utility infrastructure. A shoreline revetment with a wave break offset approximately 20 feet from shore will allow mangrove trees and other vegetation to establish a living shoreline. This approach protects infrastructure, prevents erosion, and protects water quality while providing natural shoreline habitat to support the Indian River Lagoon. The revetment and wave breaks are in place, with finishing touches on grading and planting vegetation occurring in the fall.



As part of the KARS Park restoration project, led by NASA Kennedy Space Center's Spaceport Integration and Services organization, a wave break is being created about 20 feet offshore to allow mangroves and other plants to propagate into the gap, providing protection for the shoreline. Credit: NASA/Frank Michaux

Sustainability Roadmap

In December 2021, President Biden released Executive Order 14057, "Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability," designed to reduce the federal government's greenhouse gas emissions. Kennedy is committed to achieving the seven goals laid out in the order and created a sustainability roadmap.

Energy Conservation

An awarded \$21.9 million Utility Energy Service Contract is in the design and implementation phase, which is expected to result in \$1.4 million in annual energy, water, and maintenance savings with payback within 15 years. This effort includes the design and construction of eight energy conservation measures throughout 21 facilities and exterior spaces at Kennedy. These measures include a two-megawatt solar farm, water fixtures, transformers, interior lighting, street and parking lot lighting, boilers, and heating/ventilation/air conditioning improvements.

Elliott Plantation Video and Tour

The Elliott Sugar Plantation, a 250-year-old settlement located on 2,585 acres within Kennedy, is co-managed by NASA, the National Park Service, and the U.S. Fish and Wildlife Service (FWS). In honor of the federal holiday Juneteenth, which marks the end of slavery and commemorates African American freedom and contributions to the United States, working with FWS, Spaceport Integration and Services created a video tour of the site to raise awareness.



Archeological ruins of the Elliot Plantation sugar mill are shown through the oak hammock at NASA's Kennedy Space Center in Florida on May 26, 2022. Credit: NASA/Kim Shiflett

2022 Sea Turtle Nests on Kennedy Beaches

- 7,824 Loggerhead
- 5,435 Green
- 36 Leatherbacks
- 1 Kemp Ridley
- Total Sea Turtle Nest Counts: 13,296

An endangered green sea turtle is seen in Mosquito Lagoon, which is part of Florida's Indian River. Credit: NASA/Kim Shiflett



Part of Kennedy Space Center's electric vehicle fleet is photographed in front of the Vehicle Assembly Building at the Florida spaceport. Credit: NASA/Spencer Davis

Electric Vehicle Charging

As of July 2022, alternate fuels (electricity, E-85, biodiesel) power 82% of Kennedy's general purpose vehicle fleet. Kennedy is working with commercial partner Florida Power and Light (FPL) to build 56 additional electric vehicle charging stations. FPL will install, operate, and maintain the charging stations for both government and employee-owned vehicles. This partnership contributes to the multiuser spaceport by enhancing Kennedy's electric vehicle charging capability and enabling expansion of the government electric vehicle fleet.

Safety and Mission Assurance

The Safety and Mission Assurance (SMA) Directorate ensures mission success and builds a safety culture to protect astronauts, center personnel and property, the public, and America's future in space. SMA is in everything we do at Kennedy Space Center, supporting all programs and projects across the multiuser spaceport.

SMA collaborated with the Commercial Crew Program to continue the certification and operation of spacecraft and launch systems carrying crews to the International Space Station. They performed activities for SpaceX's Crew-2 landing, Crew-3 launch and landing, Crew-4 launch, and Boeing's Orbital Flight Test-2 launch and landing. Activities included spacecraft and launch vehicle flight hardware production and refurbishment surveillance, assessing test results and nonconformances, evaluating inflight anomalies, hardware

qualification, requirements compliance audits, and identifying and mitigating hazards. The team reviewed safety, quality, and risk management documents and additionally defined safety and quality approaches for NASA's suborbital crew efforts.

SMA Launch Services Program (LSP) contributed to mission processing and launches of the Lucy, Double Asteroid Redirection Test, Imaging X-Ray Polarimetry Explorer, and Geostationary Operational Environmental Satellite-T missions. The directorate provided independent assessments of risks to mission success and ensured launch vehicle systems and integrated vehicles met NASA requirements. SMA supported LSP rolling out a new contracting structure, Venture-Class Acquisition of Dedicated and Rideshare, to provide lower-cost launch services to more risk-tolerant spacecraft customers and

promote additional competition for vehicles in the class D and sub-class D launching market. Certification for United Launch Alliance's Vulcan launch vehicle continues from the planning phase of the previous year. SMA protects NASA personnel and facilities by providing quality insight and independent assessments of launch vehicle providers, ensuring the safe processing of LSP payloads and launch vehicles.

SMA Exploration Ground Systems worked diligently toward the Artemis I launch, working three shifts to perform surveillance of numerous quality inspection points and oversee final launch preparation activities to achieve program milestones. SMA's Landing and Recovery team participated in Underway Recovery Test 9 in preparation for Artemis I and has provided

Navy divers from Explosive Ordnance Disposal (EOD) Expeditionary Support Unit 1 practice recovering a mock Orion capsule during day two of Underway Recovery Test 9 (URT-9) aboard the USS John P. Murtha. Photo credit: NASA/Frank Michaux



SpaceX's Crew Dragon atop the company's Falcon 9 rocket rolls out to Launch Complex 39A at NASA's Kennedy Space Center in Florida on April 19, 2022, in preparation for the Crew-4 launch. Photo credit: NASA/Kim Shiflett

mishap training, safety agreements, and hazard reports to ensure the team is ready for Orion's return to Earth. SMA continues to provide surveillance, work order, and nonconformance reviews of Artemis II flight hardware processing at Kennedy, including crew module testing and preparation, and work on significant ground support equipment projects, including liquid hydrogen sphere modifications at Launch Pad 39B, emergency egress system, modifications to mobile launcher (ML) 1, and procurement of ML-2 hardware.

SMA Institutional continued to make Kennedy the world's preeminent multiuser spaceport. The directorate expanded Kennedy's range safety capabilities in 2022, including the type and fidelity of analyses. SMA Institutional also worked with multiple stakeholders to clarify Kennedy's responsibilities for FAA-regulated and licensed launches/landings. SMA Institutional enhanced safety initiatives, creating a new "Fall into Safety" event in the fall and a start-of-the-year event called "2022: Safety Starts with You." Kennedy's year-round illness/injury rate was 60-80% better than the industry, exceeding the goal to be 10% better. SMA Institutional approved site plans for substantial upgrades to Launch Complex 39A infrastructure. Additionally, SMA completed pressure vessel certifications for the Apollo-era Neil A. Armstrong Operations and Checkout Building altitude chamber and for the new ML park site modifications. SMA Institutional also hosted the U.S.

Department of Labor's Occupational Safety & Health Administration (OSHA) Voluntary Protection Program (VPP) audit, and Kennedy was once again recognized as a VPP Star site.

SMA Exploration Research and Technology (ER&T) performed safety reviews to ensure safe, successful ground processing of more than 50 space station, Artemis I, and suborbital payloads, including NASA Jet Propulsion Laboratory's Earth Surface Mineral Dust Source Investigation, the U.S. Space Force's Space Test Program – Houston 9, and Kennedy's VEG-05. SMA ER&T provided safety analyses for research and technology projects, lab safety walkdowns, and safety insight of payload processing operations. The team also provided quality assurance for various experiments destined for space, rodent research, power and data testing for station utilization payloads, and space station orbital replacement unit processing. SMA ER&T performed requirements maturation and planning for Gateway's Deep Space Logistics project and supported planning for Human Landing System Program ground and lunar surface operations.

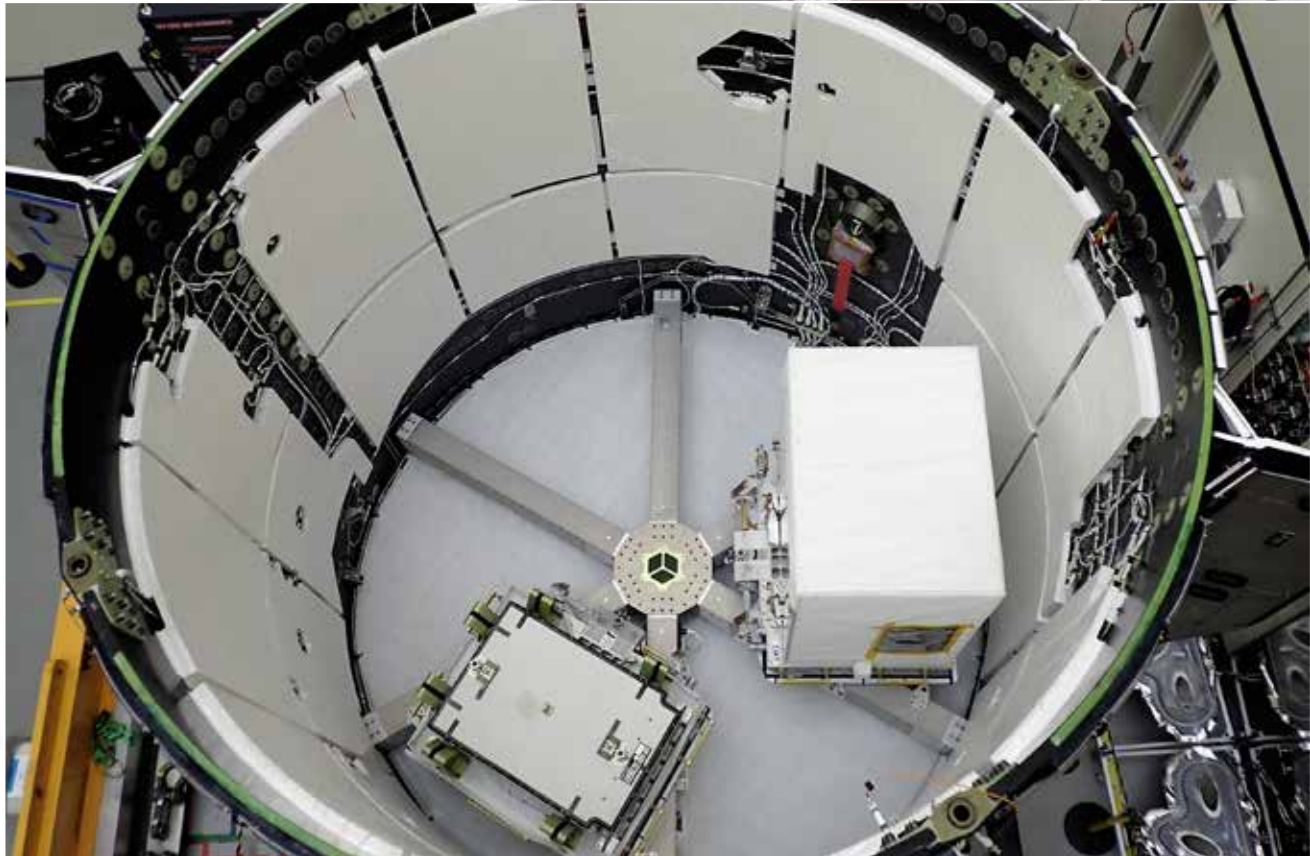
Maintaining a safe and healthy workforce remains a top priority at Kennedy. SMA will continue its mission to enable access to space while pushing boundaries and ensuring employee safety at America's preeminent multiuser spaceport. 🚀



The Star status is the highest award within the Voluntary Protection Program of the U.S. Department of Labor's Occupational Safety & Health Administration (OSHA).

Right: The payload fairing containing NASA's Lucy spacecraft is lifted at the Vertical Integration Facility at Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida on Oct. 7, 2021. Photo credit: NASA/Isaac Watson

Below: The Earth Surface Mineral Dust Source Investigation (EMIT) mission instrument (right) sits in the "trunk" that will travel aboard SpaceX's 25th cargo resupply mission to the International Space Station. Photo credit: SpaceX



A view of the Artemis I Space Launch System (SLS) and Orion spacecraft on Launch Pad 39B during sunrise at NASA's Kennedy Space Center in Florida on March 24, 2022. Photo credit: NASA/Ben Smegelsky

Communications and Public Engagement

OFFICE OF COMMUNICATION

Kennedy Space Center continues to play a crucial role in telling the NASA story and immersing the public in those stories, as we adapt to the new normal in the aftermath of the COVID-19 pandemic. Kennedy hosted virtual NASA Social events for 10 launches throughout Fiscal Year 2022, switching to in-person NASA Socials for NASA's SpaceX Crew-4 mission and the agency's Artemis I launch attempts. The virtual NASA Socials had a total of 110,000 participants, helping individuals feel connected to each mission through access to exclusive videos. Overall, these videos had 166,300 views, further highlighting the role America's premier multiuser spaceport plays in these launches.

The two in-person NASA Socials resulted in over 100 total participants, allowing individuals to experience the unique, fast-paced environment associated with a launch. Through a mix of virtual and in-person NASA Socials, Kennedy was able to continue building relationships and sharing content with space enthusiasts from around the world.

	2021	2022	Difference
Followers across accounts	4.2 million	4.6 million	9.5% increase
Engagement across accounts	3.6 million	5.53 million	53.61% increase
Facebook engagement	1.6 million	1.65 million	3.125% increase
Twitter engagement	571,800	2.35 million	310.98% increase
Instagram engagement	1.4 million	1.53 million	9.28% increase
Facebook new followers	53,600	82,474	53.86% increase
Twitter new followers	245,400	482,800	96.7% increase
Instagram new followers	166,000	173,874	4.74% increase

Virtual NASA Socials

Landsat 9	7,400 members
Lucy Mission	19,000 members
SpaceX Crew-3	5,700 members
DART Mission	5,700 members
IXPE Mission	3,900 members
GOES-T	6,300 members
SpaceX Crew-4	5,600 members
OFT-2 (Attempt 3)	7,000 members

In-Person NASA Socials

SpaceX Crew-4	35 participants
Artemis I (Attempt 1)	88 participants



Kennedy Space Center hosted an in-person NASA Social for the Artemis I launch attempt. The group was joined by Canadian Space Agency astronauts Jeremy Hansen and Joshua Kutryk, who discussed the upcoming Artemis I mission, as well as future missions to the Moon! Photo credit: NASA HQ

Media Attendance at Milestone Events

LAUNCHES			
	Mission		Media Attended
Oct. 2021	Lucy Mission Launch	Launch	89
Oct. 2021	NASA's SpaceX Crew-3 Launch	Launch	267
Nov. 2021	DART Launch from Vandenberg Space Force Base	Launch	46
Dec. 2021	IXPE Launch	Launch	71
Dec. 2021	SpaceX Commercial Resupply Services 24 Launch	Launch	81
March 2022	GOES-T Launch	Launch	191
April 2022	NASA's SpaceX Crew-4 Launch	Launch	229
May 2022	Boeing OFT-2 Launch	Launch	126
June 2022	SpaceX Commercial Resupply Services 25 Launch	Launch	70
Aug./Sept. 2022	Artemis I Launch	Launch	639
MEDIA EVENTS			
	Event		Media Attended
Oct. 2021	Path to the Pad, Orion Move to VAB	Media Event	63
Dec. 2021	Artemis Roll to the Pad	Media Event	213
Feb. 2022	Artemis Roll to Pad Event	Media Event	282
June 2022	NASA Kennedy Space Center 60th Anniversary	Media Event	39



NASA astronauts and researchers supported multiple biological research projects both during ground preparations and aboard the space station. Working closely with astronauts Shane Kimbrough, Thomas Pesquet, Megan McArthur, and Mark Vande Hei, NASA grew Hatch Chile peppers in the Advanced Plant Habitat. On Oct. 29, 2021, Vande Hei performed the first harvest of the peppers on the orbiting laboratory. The second and final harvest took place on Nov. 26, 2021. The astronauts aboard station enjoyed eating some of the peppers harvested and packaged samples of the peppers, which were returned to Earth for analysis.

The Instagram Reel of the peppers being harvested garnered more than 8.3 million views to make it one of the most viewed Reels across all agency accounts. Credit: NASA

OUTREACH AND GUEST OPERATIONS

Guest Operations:

Kennedy Space Center Guest Operations invited over 22,000 guests to 10 launches, as well as managed over 57,000 guests in other center activities in FY 2022 at America’s premier multiuser spaceport.



Artemis I First Rollout
Invited guests and NASA employees watch as NASA’s Space Launch System (SLS) rocket with the Orion spacecraft aboard is rolled out of High Bay 3 of the Vehicle Assembly Building for a 4.2-mile journey to Launch Complex 39B on March 17, 2022., at NASA’s Kennedy Space Center in Florida. The SLS rocket and Orion spacecraft are venturing to the pad for a wet dress rehearsal ahead of the uncrewed Artemis I launch. Photo credit: NASA/Aubrey Gemignani

Center Events:

Outreach and Guest Operations completed 15 center events comprising 11 in-person events attended by 15,824 employees and four online events generating over 59,000 views.



Virtual Guest Operations:

A total of 213,000 people around the world registered in the Virtual Guest Program in FY 2022, which consisted of 12 virtual guest registration opportunities. A total of 967,000 participants from all 50 states and 173 countries have registered since the program’s inception in May 2020. Over 300,000 of these virtual guests await the launch of Artemis I.



Outreach Exhibits:

Getting the word out! Kennedy Space Centers Exhibits Program attended six large-scale events directly impacting over 32,000 public attendees during FY 2022. Of the events attended, most notable were the 37th Space Symposium, MegaCon, the Pensacola Beach Airshow, Tampa Bay Comic Con, and Space Coast Pride. Attendees visit the NASA Exhibit area during the 37th Space Symposium, Tuesday, April 5, 2022, in Colorado Springs, Colorado. Photo credit: NASA/Bill Ingalls



NASA Kennedy Space Center 60th Anniversary Celebration

NASA Kennedy Space Center senior leaders helped celebrate the center’s 60th anniversary with a “Cheers to 60 Years” cake and non-alcoholic toast in the Central Campus Headquarters on June 28, 2022. Center Director Janet Petro hands a slice of cake to an employee. Also, from left are Nancy Bray, director of Spaceport Integration and Services; Kelvin Manning, deputy center director; and Hortense Blackwell, director of Communication and Public Engagement. In July 1962, the Launch Operations Center in Florida was established. By December 1963, it was renamed the John F. Kennedy Space Center. Photo Credit: NASA/Kim Shiflett



Delta Women Inspiring the Next Generation (WING)

Students from various schools and organizations with a STEM (science, technology, engineering, math) focus are photographed at the Launch and Landing Facility following their arrival to the Kennedy Space Center on Sept. 23, 2022, as part of Delta Air Lines’ Women Inspiring Our Next Generation (WING) flight. The all-female flight crew brought girls from Atlanta, Georgia, ranging in age from 11 to 15, to learn about the various careers available at the Florida spaceport. While at Kennedy, the group had the opportunity to view NASA’s Artemis I Moon rocket at Launch Pad 39B, hear from a panel of 18 women with a combination of careers from Kennedy and Delta, and tour the visitor complex. Photo credit: NASA/Kim Shiflett

VIP Tours:

A total of 342 VIP tours were completed which consisted of over 6,800 guests, some of whom were foreign delegations from Japan, Ukraine, Germany, Saudi Arabia, Turkey, and South Korea.



Kennedy Space Center Visitor Complex

Gateway is now open!
The Kennedy Space Center’s Visitor Complex opened its latest exhibit, Gateway, this year. The new offering highlights the visionary designs paving the way for human deep space travel while discovering the current cutting-edge space exploration innovations from NASA and commercial partners. Featured in this dynamic exhibit are flown spacecraft, vehicle mock-ups, the Orion Exploration Flight Test-1 Capsule, as well as a scaled model of NASA’s Space Launch System (SLS) rocket that will take NASA astronauts to the Moon and beyond. Photo credit: NASA

OFFICE OF STEM ENGAGEMENT

- Kennedy hosted more than 160 virtual OSTEM interns
- NASA Days virtual events reached 450 students at minority-serving institutions (MSIs) and resulted in 15 student internships
Participating institutions include: Texas Southern University, Texas; University of Illinois, Illinois; Bethune Cookman University, Florida; University of Recinto de Hato Rey, Puerto Rico; and Universidad InterAmerican de Puerto Rico
- LUNABOTICS robotic mining competition engaged 70 collegiate institutions from 33 states/territories, with 30% of participating institutions being MSIs
- NASA MINDS challenged 40 teams from 38 MSI institutions across 15 states to aid NASA in bridging technology gaps in support of future Artemis missions
- Next Gen STEM hosted more than 760 educators in an online community and 11 virtual classroom sessions and created two new educator guides and four online educator toolkits
- Students to Launch hosted 40 underserved middle school students during the Artemis launch attempt
- Established Program to Stimulate Competitive Research (EPSCOR) awarded:
 - ⦿ 28 Research Infrastructure Development Awards totaling \$5.6M
 - ⦿ 14 Research Awards totaling \$11.2M
 - ⦿ 39 Rapid Response Research Awards totaling \$3.9M
 - ⦿ 3 Suborbital Flight Opportunity awards totaling \$1.37 M
 - ⦿ 5 International Space Station Flight Opportunity Awards totaling \$500K
 - ⦿ 1 Fellowships Advancing Science and Technology Award of \$60K
 - ⦿ Total of \$22.6M in direct funding



Center Director Janet Petro visits with students from the United States Military Academy, during NASA’s LUNABOTICS competition on May 23, 2022, at the Center for Space Education. Photo credit: Astronaut Memorial Foundation



Workplace Overview

Kennedy Space Center is the nation's premier, multiuser spaceport. It is an integral part of the local economy, providing more than 12,000 jobs for civil servants, contractors, tenants, and construction crews. In Fiscal Year 2022, the Center tenant population increased by over 2,000 people.

The workforce includes people with diverse skills dedicated to supporting the nation's space program and NASA's exploration to destinations including the Moon, Mars, and beyond. To accomplish the agency's various missions, these individuals fulfill a multitude of tasks.

Each year, the center takes a snapshot of its workforce. This picture includes all federal and contractor employees chartered to work for Kennedy. Personnel serving other organizations, such as Cape Canaveral Space Force Station, support the spaceport's operations but are not reflected in these numbers.

The civil servant skill mix includes those in science, technology, engineering, and mathematics positions, as well as those in professional administrative and clerical positions. All employees work together to explore the universe for the benefit of all mankind.

Kennedy Space Center Workforce Profile

Civil Servants	2,030
NASA Pathways Interns	54
Total Civil Servants	2,084
* Includes 3 NEX, 1 full-time temp, 204 full-time perm employees, and 10 part-time perm employees.	
Civil Servants Skill Mix	
Scientific, Technology, Engineering and Mathematics	69%
Clerical and Professional Administrative	31%
On-site Contractor Employees	4,999
Off-site/Near-site Contractor Employees (Excludes construction workers)	96
Total Contractor Employees	5,095
Total Construction Workers	336
Total Tenants	5,342
TOTAL KSC POPULATION	12,857

Civil Servants as of September 24, 2022
Contractors, Construction Workers and Tenants as of June, 30 2022

Diversity and Equal Opportunity

At NASA, we make Air and Space available for everyone.

DID YOU KNOW?

NASA (KSC) Employees Believe*:

Managers and supervisors are committed to a workplace representative of all segments of society (93%)

They can disclose a suspected violation of any law, rule, or regulation without fear of reprisal (88%)

Their talents are used well in the workplace (83%)

They are encouraged to come up with new and better ways of doing things (87%)

*Source: 2022 Federal Employee Viewpoint Survey



AGE DEMOGRAPHICS at KSC

- Boomers (born 1946 – 1964) 23%
- Gen X (born 1965 – 1979) 37%
- Millennials (born 1980 – 1996) 37%
- Gen Z (born 1997 – 2012) 3%

- Average age: 46 years
- Most junior employee: 19 years
- Most senior employee: 76 years

Minorities in Engineering in the last 30 years:

- The employment of NATIVE AMERICAN engineers averaged 1%
- The employment of HISPANIC engineers averaged 14%
- The employment of AFRICAN AMERICAN engineers averaged 9%
- The employment of ASIAN PACIFIC ISLANDER engineers averaged 7%
- The employment of MULTIRACIAL engineers averaged 2%

NASA centers' Office of Diversity and Equal Opportunity continually provide training on topics such as disability awareness, conflict management, and diversity and inclusion.

Correlation Between:

84	Job Satisfaction
89	Engagement
89	Diversity, Equity, Inclusion, and Accessibility Average
96	Performance Confidence

Budget Authority

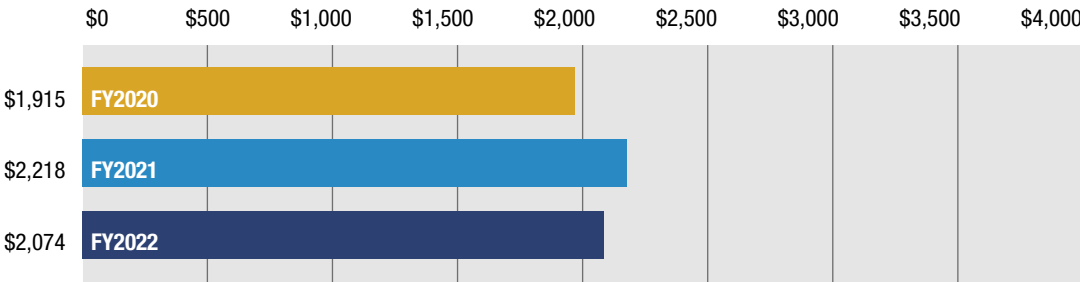
Kennedy Space Center

FY 2022 Budget Authority (\$ in Millions)

Commercial Crew Program	\$566
Exploration Ground Systems	\$581
Launch Services/Science	\$273
Mission Services and Capabilities (MSaC)	\$236
Engineering, Safety and Operations (ESO)	\$121
Space Station	\$46
Other	\$251
Total KSC	\$2,074

NASA/KSC Budget Authority Summary

FY 2020 through FY 2022 (\$ in Millions)



FY 2022 KSC Budget by Element (\$ in Millions)



Industry Partners at a Glance

Space Exploration Technologies Corp.

Space Exploration Technologies Corporation (SpaceX) participated in NASA's goal of developing orbital commercial Crew Transportation Systems. Under the Commercial Crew Transportation Capability (CCtCap) contract for NASA's Launch America initiative, SpaceX was tasked with providing safe, reliable, and cost-effective crew transportation to and from the International Space Station on American spacecraft launched from the United States. Under the NASA Launch Services II (NLS II) contract, SpaceX provides complete launch services to the Launch Services Program (LSP). In addition, SpaceX is the contractor for the Deep Space Logistics Gateway Logistics Services (GLS) contract. In this role they will provide delivery of cargo, experiments, and other supplies to the Gateway.

Jacobs Technology Inc.

Jacobs Technology Inc., prime contractor for the Test and Operations Support Contract (TOSC), was responsible for the overall management and implementation of ground systems capabilities, flight hardware processing, and launch operations at Kennedy. Specific services provided by Jacobs Technology under TOSC include launch vehicle, spacecraft, and payload integration and processing; operations and development of associated processes for ground systems to support integration, processing and launch; servicing and testing of flight hardware; and launch of development and operational flights at Kennedy.

PAE-SGT Partners LLC

PAE-SGT Partners LLC (PSP) performed institutional support services at Kennedy and NASA facilities at its neighboring Cape Canaveral Air Force Station under the Base Operations, Spaceport Services (BOSS) Contract. PSP provided mission-focused institutional support, including operations, maintenance, and engineering of assigned facilities, systems, equipment and utilities; work management and spaceport integration functions; mission support and launch readiness management; project management and design engineering services; construction support services; and institutional logistics.

Amentum Services, Inc.

Amentum Services provided laboratory support services and operations for Kennedy Space Center. Amentum was responsible for the operation, maintenance and engineering for a diverse set of laboratories, developmental shops and test facilities. Amentum Services also was responsible for program management, laboratory maintenance and support, operational laboratory services, and professional and technical support for scientific research, engineering analysis, test and evaluation in laboratory environments.

Air Products and Chemicals, Inc.

Air Products and Chemicals, Inc. (APCI), provides bulk liquid helium (LHe) to Kennedy Space Center (KSC). The Government requires the delivery of bulk LHe and the lease of six helium pumps at KSC to support a range of activities at KSC and Cape Canaveral Space Force Station (CCSFS). LHe is converted to gaseous helium (GHe) through a pressurization process using an APCI proprietary LHe pump. The high pressure GHe is in turn pumped into the KSC GHe pipeline and is distributed and utilized by nearly every customer at KSC and CCSFS. GHe is used as an inert purge gas for hydrogen systems and as a pressurizing agent for ground and flight fluid systems. Helium is also used for spacecraft and launch vehicle processing, launch operations, and as a cryogenic cooling agent.

J.P. Donovan Construction, Inc.

J.P. Donovan Construction, Inc., provided general contracting management and construction services for Exploration Ground Systems' mobile launcher ground support equipment installation effort. The mobile launcher modifications are necessary to meet NASA's beyond Earth orbit mission. J.P. Donovan Construction also was the prime contractor for the Pad 39B flame trench deflector and refurbishment, and the center's shoreline restoration effort.

Your Procurement Dollars at Work

Geographical Distribution by State (Fiscal Year 2022 Obligations)

STATE	TOTAL DOLLARS	STATE	TOTAL DOLLARS
ALABAMA	24,682,039	MISSOURI	1,822,388
ALASKA	425,475	NEVADA	14,177,285
ARIZONA	773,647	NEW HAMPSHIRE	7,500
CALIFORNIA	811,727,009	NEW MEXICO	5,928,250
COLORADO	42,118,390	NEW YORK	476,659
CONNECTICUT	6,672,936	OHIO	2,034,359
FLORIDA	121,179,300	OKLAHOMA	9,077,504
GEORGIA	1,219,834	PENNSYLVANIA	54,635,795
IDAHO	61,890	TENNESSEE	320,272,761
INDIANA	2,152,350	TEXAS	38,083,508
LOUISIANA	4,603,269	VIRGINIA	185,933,720
MARYLAND	105,191,415	WASHINGTON	5,000
MICHIGAN	312,308	TOTAL STATE OBLIGATIONS	1,753,574,600

Top 25 KSC Business Contractors for FY 2022

Contractor	Dollars
SPACE EXPLORATION TECHNOLOGIES CORP.	775,433,326
JACOBS TECHNOLOGY INC.	315,504,776
PAE-SGT PARTNERS LLC	97,838,858
AMENTUM SERVICES, INC.	58,074,475
AIR PRODUCTS AND CHEMICALS, INC.	48,883,439
J.P. DONOVAN CONSTRUCTION, INC.	47,629,708
UNITED LAUNCH SERVICES, LLC	40,523,621
AI SOLUTIONS, INC.	38,052,666
BECHTEL NATIONAL, INC.	34,955,535
CHENEGA INFINITY, LLC	31,846,918
ARES TECHNICAL SERVICES CORPORATION	26,275,604
THE BOEING COMPANY	20,731,155
AIR LIQUIDE LARGE INDUSTRIES U.S. LP	15,321,620
HSG, LLC	14,177,285
ASTROTECH SPACE OPERATIONS LLC	11,181,403
FLORIDA POWER & LIGHT COMPANY INC.	10,919,381
WRIGHT BROS., LLC	9,889,413
CHENEGA GLOBAL PROTECTION, LLC	9,431,660
DIVERSIFIED CONSTRUCTION OF OKLAHOMA, INC.	9,077,504
ASRC FEDERAL DATA SOLUTIONS, LLC	9,075,524
A-P-T RESEARCH, INC.	8,711,662
BREVARD ACHIEVEMENT CENTER, LLC	7,666,881
SES CONSTRUCTION AND FUEL SERVICES LLC	7,533,133
LINDE INC.	6,672,936
ADVON CORPORATION	6,288,267
TOTAL	1,661,696,750



National Aeronautics and Space Administration
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Kennedy Space Center, FL 32899
Public Affairs Directorate

www.nasa.gov

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